

REMARKS

Claims 1-12 are pending in the present Application. No claims have been canceled, amended, or added, leaving Claims 1-12 for consideration upon entry of the present Amendment.

Interview Summary

Pursuant to Applicant's agent's telephonic requests of December 1, 2009, December 4, 2009, and December 7, 2009, a telephonic interview was held with Examiner Martin and Applicant's agent, Dana Gronbeck, on December 9, 2009 to discuss the outstanding rejection under 35 U.S.C 103(a) of the instant Claim 1 over KR 10-2000-0014672 ("Kim", machine translation), in view of U.S. Patent No. 6,287,723 ("Maeda"), and the response to Office action filed on May 4, 2009 (in response to the previous Office Action dated December 9, 2008). During the interview, the prior response was discussed and, in particular, the teachings of Kim, which discloses a styrene butadiene rubber (SBR) binder, a carbon active material, a binder (which may be cellulosic, such as carboxymethylcellulose, CMC), and water, but which does not disclose any surfactant or dispersant whatsoever; and the teachings of Maeda which disclose an emulsion prepared from ionic or non-ionic monomers (see e.g., exemplary monomers in Col. 3, beginning on line 39) and if desired, ionic monomers (see Col. 4, beginning on line 16) where exemplary polymers prepared by emulsion polymerization of the monomers include homopolymers and copolymers of these monomers. Applicant's position was presented and argued that though Maeda teaches non-ionic surfactants (e.g., polyoxyethylene alkyl ether; see Col. 2, line 59 to Col. 3, line 8), Applicants maintain that Maeda does not disclose incorporation of the non-ionic surfactants so listed, into the polymer chain of the emulsion polymer; and as is known in the art of emulsion polymerizations, these surfactants are dispersed in, but not attached to, the emulsion polymer. Applicant's therefore concluded that Maeda teaches a mixture of an emulsion polymer, with surfactants dispersed in it, but does not teach that the disclosed surfactants are covalently attached by emulsion polymerization to the emulsion polymer chain as claimed in Claim 1, and therefore the 103 rejection over the combination of Kim and Maeda should be withdrawn.

The Examiner did not agree and performed a word search during the discussion and

noted that polyethylene oxide was disclosed as a water soluble polymer in Maeda on Col. 7, line 27. Applicants noted that the water soluble polymers listed in Maeda included, for example, carboxymethylcellulose (Col. 7, line 25) which was disclosed in Kim as being a binder (and as a thickening agent in the instant Specification), and that therefore the water soluble polymers were therefore not dispersants; and further, that polyethylene oxide does not correspond to the dispersant claimed in Claim 1 which, for example, may be a copolymer of polymethylmethacrylate and polyethylene glycol as described in e.g., Example 1 of the instant Specification.

The Examiner then indicated that the 103 rejection over Kim and Maeda could not be removed at least until after submission and consideration of a response and consultation with the Examiner's supervisor, and that an additional search would be conducted. The interview essentially concluded at this point.

Applicants respectfully request that if any portion of the interview was inadvertently omitted, to please so inform Applicants. Applicant's agent also wishes to sincerely thank the Examiner for the courtesy shown during the interview.

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 103(a)

Claims 1-12 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over KR1020000014672 ("Kim") in view of U.S. Patent No. 6,287,723 B1 ("Maeda"). Applicants respectfully traverse this rejection.

Kim discloses a styrene butadiene rubber (SBR) binder, a carbon active material, a binder (which may be cellulosic, such as carboxymethylcellulose, CMC), and water. Kim, e.g., paragraph [18].

Maeda discloses an emulsion polymer (Col. 5, lines 47-62), which is prepared from non-ionic monomers (see exemplary monomers in Col. 3, beginning on line 39) and if desired, ionic monomers (see Col. 4, beginning on line 16); and that exemplary polymers prepared by emulsion polymerization of the monomers include homopolymers and copolymers of these monomers. Maeda also teaches non-ionic surfactants (e.g., polyoxyethylene alkyl ether). Col.

2, line 59 to Col. 3, line 8.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that all elements of the invention are disclosed in the prior art; that the prior art relied upon, or knowledge generally available in the art at the time of the invention, must provide some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). “A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR Int’l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007). To find obviousness, the Examiner must “identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does.” *Id.*

As noted in the instant Specification, an electrode active material slurry having only a binder comprising a styrene-butadiene-based polymer resin and a thickener comprising a cellulose-based or an acrylate-based resin does not provide the desirable dispersion of the electrode active material (i.e., a carbon based electrode active material) due to the difference of the specific gravity of the carbon-based electrode active material and those of the binder and thickener. See Specification, p. 3, line 29 to p. 4, line 10.

The invention claimed in Claim 1, however, improves the dispersion properties of inert carbon-based anode active materials and/or carbon-based conductive agent, through use of “a dispersant characterized by comprising [a] a polymer backbone capable of physically bonding, i.e., adsorption, to the surface of carbon and [b] a side-chain having surfactant properties required for dispersion, in the same molecule.” See Specification, p. 7, lines 20-28. Claim 1 thus claims, *inter alia*, “a dispersant comprising a polymer backbone capable of surface-adsorption and a side-chain having non-ionic surfactant properties.”

Applicants assert that Kim in view of Maeda does not disclose or suggest a dispersant having a backbone capable of surface absorption and a side-chain having non-ionic surfactant properties, and does not teach the desired carbon-dispersing effects of this dispersant, and therefore Kim in view of Maeda does not teach all elements of the instant claims, and does not provide a suggestion or incentive that would lead one skilled in the art to modify the combination.

Neither Kim nor Maeda discloses the dispersant claimed in Claim 1. In order that the dispersant accomplish the aforementioned purpose of the instant invention, to disperse a carbon electrode active material in an SBR/Binder matrix, a polymer backbone capable of adsorption to the surface of carbon and a side-chain having surfactant properties required for dispersion must be present in a single molecule. This technical feature of is neither disclosed nor suggested in either of the cited references, Kim or Maeda, and cannot be ascertained from the combination.

Specifically with respect to the combination of Kim and Maeda, Kim discloses that a *nonionic polymer* as an anode binder is obtained by emulsion polymerization of at least one nonionic monomer in the presence of a nonionic surfactant. See Maeda, Col. 2, lines 47-58. However, Maeda neither discloses nor suggests, as the Examiner has alleged, that the polymer obtained by emulsion polymerization of the nonionic monomer in the presence of the nonionic surfactant form a copolymer as required by instant Claim 1, to thereby include the nonionic surfactant as a side chain, and polymer backbone, in one single molecule.

It is understood in Maeda and in the emulsion polymerization art in general that the nonionic polymer, prepared by the disclosed emulsion polymerization, forms emulsion particles, and that the nonionic surfactant when present is dispersed in the resultant polymerization product of the nonionic monomer (i.e., the particles), and the nonionic surfactant and the polymerization resultant of the nonionic monomer would phase-separate as two separate compounds, i.e., as polymerization product interspersed with surfactant. Nowhere in Maeda is it suggested that the nonionic dispersant reacts with the monomers in the emulsion polymerization to produce a polymer backbone and side chain, as alleged. Thus, in Maeda, the nonionic surfactant included in the emulsion polymerization cannot be a side-chain, and the polymerization resultant of the nonionic monomer is therefore not a polymer backbone to which the surfactant is attached, and therefore neither Maeda nor the battery art as a whole provide a reason for one of ordinary skill in the art to modify Kim in the manner required to meet Claim 1. *In re Laskowski*, 871 F.2d 115, 117, 10 U.S.P.Q.2d 1397, 1398 (Fed. Cir. 1989) (“Although the Commissioner suggests that [the structure in the primary art reference] could readily be modified to form the [claimed] structure, ‘[t]he mere fact that the prior art could be so modified would not have made the modification obvious unless the prior

art suggested the desirability of the modification”) (citation omitted); *In re Stencel*, 828 F.2d 751, 755, 4 U.S.P.Q.2d 1071, 1073 (Fed. Cir. 1987) (obviousness cannot be established “by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion that the combination be made”). There is no teaching or suggestions to combine elements of the prior art to produce the present invention. The present invention is thus nonobvious.

Applicants therefore respectfully submit that Maeda does not teach a dispersant having a polymer backbone with a side-chain nonionic surfactant (Col. 2, lines 56-67) such as polyethylene oxide, polyoxyethylene alkyl ether, polyoxyethylene alkyl aryl ether” (Col. 2, lines 59-67 and Col. 3, lines 1-8) grafted on it to form the side chain, and therefore fails to teach all elements of the instant claims, and fails to provide a suggestion or incentive that would lead one skilled in the art to so modify the combination.

Also, Maeda discloses that the amount of the anionic surfactant based on the total solid amount of surfactant should be not more than 10 wt%. Col. 3, lines 17-20. Applicants note however that the anionic surfactant is not disclosed or taught to be the same in Maeda as the non-ionic surfactant of Col. 2, lines 56-67, and thus Applicants do not agree that this disclosure of the anionic surfactant in Maeda is relevant to the inclusion of a non-ionic surfactant as a side chain as claimed in Claim 1. Maeda does not appear to disclose the amount of non-ionic surfactant used in the emulsion polymerization.

Further, the polymerization resultant of the nonionic monomer is disclosed to be, not a dispersant as alleged, but a *binder* in Maeda. Maeda additionally discloses that the *binder* includes a polymer (such as a water-insoluble polymer, a water-soluble polymer (e.g., polyethylene glycol), or a combination of both) other than the above nonionic polymer, and preferred example of the water-insoluble polymer is polyvinylidene fluoride (PVdF). Maeda, Col. 6, lines 60-67 and Col. 7, lines 1-4. Thus, Maeda discloses polyvinylidene fluoride (PVdF), not as a polymer backbone in the dispersant, but a binder, and furthermore does not suggest modifying a PVdF backbone to have a side chain of a surfactant.

Apart from the lack of a dispersant (as claimed in Claim 1) in the compositions of Kim or Maeda, there is further no suggestion or incentive to combine Kim with Maeda as each discloses a different anode active material. Maeda discloses anode active materials including

a hydridable alloy or a cadmium alloy. Maeda, Col. 7, lines 55-56. A carbon material may also be present as a conductive material, in amounts of 0.2 to 10 parts by weight based on anode active material. Maeda, Col. 7, line 66 to Col. 8, line 7. Thus, it is required that Maeda include a metal anode active material. Kim, however, discloses carbon and carbon composite as the anode active material, where carbon is required because water content of soft carbon is low, and water is the solvent. Kim, [11], [14] and [17].

As the slurry of Kim is entirely carbon, there is no suggestion that modifying Kim with the limitations of Maeda, which requires a hydridable metal alloy or cadmium alloy, would provide the composition claimed in Claim 1. The Applicants therefore respectfully submit that the Examiner, in arriving at this specific construction, has destroyed the intent of the references. In this regard, the courts have held that “[i]f the proposed modification would render the prior art invention being modified unsatisfactorily for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon* 733 F. 2d 900, 221 USPQ 1125 (Fed. Cir. 1984). The courts have also held that “[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious.” *In re Ratti* 270 F. 2d 810, 123 USPQ 349 (CCPA 1959). To combine references, a hydridable metal alloy or cadmium alloy (as disclosed in Maeda) would have to be compatible with the composition of Kim which does not teach such metals, and to include a metal anode active material in Kim would render Kim would change the principle of operation of Kim; conversely, to remove the hydridable metal alloy of Maeda to comport to the anode active material slurry of Kim would render Kim unsuited to its intended purpose. For these reasons at least, there is no suggestion or incentive to modify Kim with Maeda, with an expectation of success for the combination.

Further, there is no suggestion in either Kim or Maeda of the unexpectedly beneficial property of the use of a dispersant in specifically dispersing the carbon in the anode active material slurry to overcome the mismatch in density between the carbon-based anode active material and the binder. Kim is silent as to this, as it discloses no dispersants, and Maeda, which does not use a carbon anode active material, does not provide a suggestion or incentive that any of the emulsion polymers provided in Maeda would provide this unexpected result

(see e.g., FIG. 6 which shows a sharper drop in charge/discharge rate for Comparative Example 2 without dispersant (but with CMC as a binder as disclosed in Kim), and Example 1 which includes both CMC and a dispersant as claimed. The combination is silent as to these unexpected and improved properties, and thus Kim in view of Maeda cannot fairly be said to teach the invention claimed in Claim 1.

Therefore, for at least the above reasons, the dispersant claimed in Claim 1 is not disclosed or suggested by Maeda since there is no suggestion that the surfactant of Maeda react to form a side chain off a polymer backbone to provide the dispersant of Claim 1, and hence Maeda fails to remedy the deficiencies of Kim. Further there is no suggestion to combine Kim and Maeda as each teaches the exclusion of the other. Therefore, the combination of Kim and Maeda does not disclose the anode active material slurry claimed in Claim 1, and its dependent claims, and the combination therefore does not render the instant claims unpatentable.

Conclusion

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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